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**No. 144**



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CHINA REPORT  
SCIENCE AND TECHNOLOGY  
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APPLIED SCIENCES

ELECTRONIC TECHNOLOGY TESTED IN MAY 1980 ROCKET LAUNCH

Beijing DIANZI KEXUE JISHU in Chinese No 120, Nov 81 pp 43-48, 35

[Article by Gu Zengpei [7357 1037 3099]: "Talking About Achievements and Problems in Our Nation's Electronic Technology Based on the Launching of the Cargo Rocket Into the Pacific"]

[Text] In May 1980, our nation successfully launched a cargo rocket into the Pacific Ocean. This event was not only a major test of our nation's rocket technology, but it also provided an overall examination of our nation's electronic technology. Electronic technology is the technology of extracting, handling and processing information. Some people have generalized it in the following six words: measurement, transmission, recording, display, computation and control. In this experiment, the functions of these six aspects were all fully utilized.

Measurement: Tracking measurements are among the most important contents in the flight test of cargo rockets. We must not only utilize the technology of remote measuring to measure and transmit to the ground the various fast changing and slow changing parameters inside the rocket during the course of flight of the cargo rocket, we must also track and observe the rocket from the ground and accurately measure the flight path from the launching point to the point of splashdown. The requirements for accuracy are high. For example, on the major arc of the flight path, the precision of velocity measurements in the X, Y, Z directions of motion must reach a few centimeters per second, and the precision of positioning must reach a magnitude within meters. To receive such high-precision requirements, the whole plan for measurements uses many systems, including single pulse radars, continuous wave interferometers, and continuous wave multiple station distance and velocity measuring systems in order to develop the advantages of the different systems. To measure all data of the flight path in the experiment, we not only established many measuring stations on the ground, but we also built two oceangoing measuring ships with relatively complete functions. The oceangoing measuring vessels themselves constitute a small but complete electronic world integrating "measurement, transmission, recording, display, computation, control" in one entity.

Recording: The various data obtained in the experiment are partially used in real-time processing and real-time control. A large amount of the data is used for precise data processing afterward. A small portion of the data is recorded

on film using optical methods; a large portion of the data is recorded using electronic recording techniques. The internal parameters of the rocket are transmitted to the ground via real-time remote measurements and they are also recorded by magnetic recording devices which are ejected from the rocket and retrieved before splashdown. The data capsule salvaged from the ocean contained such devices.

**Display:** The various types of information obtained in the test flight of the cargo rocket are not only transmitted to the localities needing the information; frequently they must be converted into numerical data, words, symbols or images and be displayed on screen or display panels so that related personnel at each level can directly view and understand the situation in order to make timely judgments.

**Computation:** The flight course of the rocket is short, but a large amount of data has to be processed. For example, real-time control of the cargo rocket, mathematical guidance needed by the measuring stations scattered in various localities to capture the target, maintaining the stability of tracking the target by the measuring equipment while positioning the measuring vessel and while the vessel is rocking, and converting the primary data into display signals all require high-speed computation by the computer. In this experiment, over 20 large, medium and small computers were used, ranging from those capable of performing several tens of thousands of operations per second to those with a magnitude of a million operations per second, satisfying the needs of real-time processing and later data processing.

**Control:** Control is an important aspect in space electronics technology. During the course of the experiment, the computer on board the cargo rocket and the mechanisms of execution correctly controlled the various movements of the rocket and insured that the load accurately entered the predetermined orbit. The ground remote control facilities performed real-time safety control of the rocket. If the rocket had malfunctioned and deviated from the flight path, the remote control facilities would have immediately sent out a destruct command to the rocket, in accordance with the computational results of the computer, in order to avoid or reduce any possible damage to the ground surface from the falling rocket. Of course, in the test, the rocket performed normally and always followed the correct flight path, so this type of command was not used, but the safety control system always reliably maintained this type of function. Since 1975, our nation has successfully controlled satellites' accurate return to the ground several times. This is the best indication of the standard our nation's remote control technology has already reached.

During the entire course of the test, the electronic equipment on board the cargo rocket operated normally according to predetermined procedures with the several dozen large computer facilities on the ground. The flow of information was rational and smooth, the data interfaces were correctly connected, there were no blocks or interference, the distribution was appropriate, the operations were coordinated, and unprecedented complete experimental data were obtained. Therefore, it can be said that in this overall examination of electric technology, regarding either single technologies or the entire project, all received passing grades. This achievement indicates that our nation's electronic engineering and technology have already reached a relatively high standard.

But compared to technologically advanced nations, the present stage of our nation's electronic technology still lags a definite distance. Technological deficiencies exist in all aspects--measurement, transmission, recording, display, computation and control. Our development and production units must exert efforts to overcome them. To continue to develop our nation's electronic technology, to enable our nation's electronic engineering equipment to have a definite capability to compete internationally, we have proposed some problems of a general nature as reference for electronic technology workers and electronic engineering and technology management departments.

1. Place improvement of reliability in front. Poor reliability is the greatest weakness of our nation's electronic engineering and technology. The electronic equipment that was used in this test was selected on the basis of superior quality and was carefully maintained, but there were still some individual pieces of equipment that partially malfunctioned during operation, and this shows the seriousness of the problem. Most of the equipment performed reliably during preparation of the tasks and during the course of operation because the development and production units strengthened quality control and the components were strictly broken in and screened, designs for reliability were made and reliability indices were assigned to every subunit, and every subunit was examined and evaluated according to these indices; therefore, the reliability indices of the entire body of equipment were insured. In addition, to adapt to the needs of the cargo rocket, during recent years, the production of key components followed the "seven specializations" (specialized personnel, specialized machinery, specialized materials, specialized branches, specialized inspection, specialized screening, and specialized control), and visible results were obtained. The reliability standards were improved by one magnitude on the original foundation.

These practices show that if the work is conscientiously and concretely carried out, if definite efforts are exerted, the present situation of reliability can be changed relatively quickly. Poor reliability is a problem of electronic technology; it is also a problem in management of scientific research and production. Improving reliability can only be accomplished well if it is emphasized from top to bottom and if it is placed in the foremost position.

2. Emphasize basic electronic products. The development of electronic engineering and technology and the improvement of the performance of electronic equipment are inescapably limited by the performance of the basic products. Space electronics technology and the accompanying ground facilities frequently make certain relatively high demands upon the frequency range, frequency band, sensitivity, stability, accuracy, power, power consumption, weight, dimension and environment. Whether these can be achieved in design is frequently determined by the properties and quality of the basic products--transistors, electro-vacuum devices, integrated circuits, waveguides, cables, printed circuit boards, connectors. The performance indices of these basic products are again limited by the raw materials, materials, reagents, processing techniques and processing technologies. It can thus be seen that to produce the basic electronic products well involves a very broad scope and requires common scientific and technological efforts, organization and coordination. The leading agencies must possess the spirit of following through to the end in order to solve the "bottlenecks" in certain links in time. At the same time, it is worth noticing that only

those new products that are technically mature can be used in electronic engineering, and an appropriate leeway must be left in the design to insure that the new products will operate stably and reliably in engineering projects.

3. Improve the level of automatic monitoring and testing. As the functions of electronic equipment continue to increase, the equipment becomes more complex technically. If the means of debugging and testing the equipment remain at the original level, if we still rely on traditional meters, if we still read, convert, adjust and measure various parameters manually and also operate and maintain the equipment manually, then the users will necessarily experience great difficulty, and it will be difficult to satisfy the requirements of time and efficiency in carrying out the experimental task.

In recent years, our nation's microprocessors have developed rapidly. Widespread use of microprocessors is an effective means of improving the level of automatic monitoring and testing. Even in very complex equipment, if microprocessors can be closely integrated into them, with the addition of centralized and directly visible word or image displays, the operation and maintenance will surely be greatly simplified, thus reducing the number of workers and reducing operational errors.

4. Improve service, be technically responsible to the end. It is difficult to solve completely the problem of reliability of our nation's electronic equipment, and the gap between our level of development and the advanced level of foreign nations cannot be quickly closed. The remedy is to start out from the actual situation in our nation and greatly improve technical services. In ground equipment for satellites and cargo rockets, the research and development units have always provided technical services for the users following the principle of "being technically responsible to the end." This means that they are not only responsible for installation, testing and technical training in new equipment, for guaranteed repairs and other technical support within a definite period, but they are also responsible for sending technical personnel quickly to help solve problems which the users cannot solve, whenever and whatever problems arise. This service of being technically responsible to the end should be available for all large items of electronic equipment, and this can be done. This is the greatest advantage our nation's research and development units have in the domestic market in competition with foreign firms. It should be fully developed.

5. Reduce cost and price. Domestically manufactured electronic products, especially basic products, are too high priced; compared to similar foreign products, the prices of some are higher by several times and even by several dozen times, especially products with relatively high reliability. This is one of the important reasons the users are willing to purchase foreign products. If the prices do not drop, then due to economic behavior, as a result, large users will purchase products abroad while small users will not use the products because they cannot afford them. In this way, it will be difficult for the development of the electronic industry and electronic technology to be maintained. The research, development and production departments of electronic products must think of ways to improve business management, improve technology and techniques, improve the percentage of finished products and of superior products, reduce waste, sell more at lower profits, and reduce cost and prices on a large scale.

6. Establish a system for demonstration and proof of validity of imports and appropriately limit imports. To hasten our nation's buildup of the four modernizations, it is extremely necessary to import advanced foreign technology. But because certain departments lack concrete understanding of the domestic level of electronic technology and because of ambiguity in the guiding ideology or other factors, a phenomenon of blindly importing certain large items of electronic equipment and systems has emerged in recent years. If this phenomenon is not changed, the further development of our nation's electronic technology will be seriously affected. A portion of the work force with a relatively high level of development in electronic technology that has already been formed may become stagnant or may deteriorate.

Viewing the level of our nation's electronics industry and electronic technology on the basis of the test launching of the cargo rocket into the southern Pacific, we can make the following estimate: The electronic engineering facilities and electronic equipment needed at present in our nation's construction can mostly be developed and produced by ourselves. Therefore, we must look only at importing advanced technology and equipment which our nation cannot develop and produce technically yet. If we can produce the equipment, even though the individual indices may be poorer, we should actively organize the forces to carry out the work and create the conditions for producing the equipment ourselves. If certain basic electronic products present a problem, we can import some components and spare parts. We should purchase from abroad only those things that we are truly unable to develop and manufacture in our nation at the present stage. For this, it is suggested that the concerned leading agencies should establish some kind of demonstration and validation system to examine the value of imported items when reviewing and approving applications for importing electronic equipment. Only those items that have been technically proven to be valuable for import should be approved.

#### Voltage Regulated Power Supply Circuit

The voltage regulated power supply circuit shown in Figure 1 uses a bridge-type full wave rectifying capacitor input.  $C_1$ ,  $R_1$ ,  $C_2$  form the first  $\pi$  wave filter;  $R_2$ ,  $D_1 + D_2$  form the second wave filter and the preregulated voltage;  $R_3$ ,  $D_3 + D_4$  form the third wave filter and the second regulated voltage; the function of  $BG_1$ ,  $BG_2$  is to amplify the output current;  $BG_3$  to  $BG_5$  form the complementary complex emitter-follower combined with  $R_4$ ,  $R_5$  to lower the output resistance;  $R_6$  is the protective resistor.

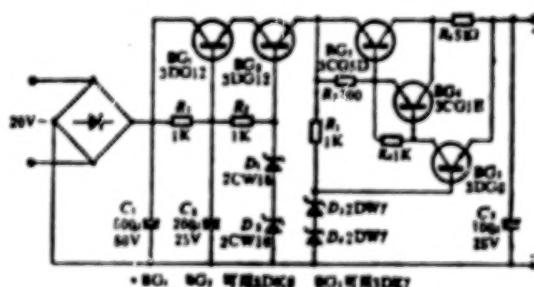


Figure 1.

\* $BG_1$ ,  $BG_2$  can use 3DK9;  $BG_3$  can use 3DK7

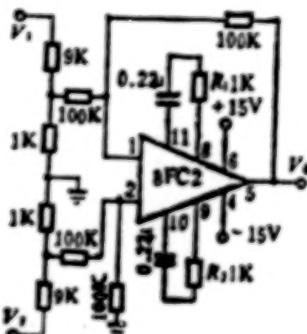
The main technical specifications of this circuit are:

1. Load current: 5 to 50 mA
2. Output resistance: > 0.1  $\Omega$
3. Ripple voltage: > 10  $\mu$ V (peak-peak)

### Discussion:

1. If  $BG_1$  is absent, i.e., the  $BG_2$  collecting electrode is directly connected to  $C_1$ , then the output ripple voltage will increase to about  $30 \mu V$ .
2. If we want the output resistance to be even smaller, we can use an appropriate steady flow diode to replace  $R_4$ ,  $R_5$ , and at the same time select tubes with a relatively high  $\beta$  value for  $BG_3$  to  $BG_5$ . In this way, the output resistance can be reduced to below  $0.01 \Omega$ .
3. If we need a voltage of  $6V$ , we only need one voltage regulator. If we need a negative voltage, we only need to change the PNP type triode to the NPN type, and the NPN type to the PNP type, and reverse the polarity of the electrolytic capacitor and the diode. (Xu Zhongchang [6079 0112 2490])

## Voltage Comparator



Except for  $R_1$ ,  $R_2$ , the precision of the resistors is all 0.01 percent

Figure 2.

Figure 2 shows a voltage comparator consisting of a domestically produced 8FC2 integrated computational amplifier; the output voltage  $V_0 = V_1 - V_2$ . Because the open loop gain and the input impedance of the 8FC2 are both high and because a precision resistor is used, therefore the precision is relatively high.

Results of measurements of the circuit shown in the diagram in Figure 2 are listed in the following table.

$V_1$ (V)	60	60	60	60	60	60
$V_2$ (V)	60	54	52	48	44	40
$V_0$ (V)	0	4	8	12.14	16.25	20.29

(Zhang Xiancun [1728-0341-1317])

### Using an Ordinary Diode To Realize Linear Frequency Modulation

We have discovered in practice that using an ordinary diode not only can realize frequency modulation, but the linearity of frequency modulation is also good. We have used the circuit illustrated below to perform some experiments. The diodes used were 2CP11, 2A17, 2AK9; the modulating voltage was a sawtooth wave of 0 to 20 V. The oscillating frequencies of the oscillator were tested at 10, 100, and 1,000 KHz; the degree of modulation could reach 3 to 5 percent, and the linearity was good. The circuit is simple, power loss in modulation is small, and the cost is low. If we change to a variable capacitance diode, the degree of modulation can be further improved. Because the oscillator oscillates only when there is a relatively strong positive feedback, therefore the output wave form is slightly distorted.

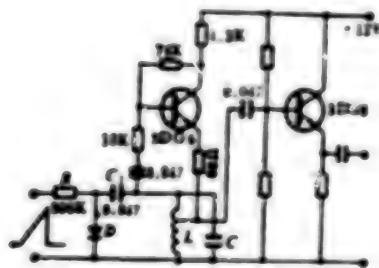


Figure 3.

(Yan Yisheng [7051 1355 3932] of Northwest Industrial University)

### Solar Tracking Drive Circuit

The solar light sensing device used in this circuit is illustrated in Figure 4. In the center is glued a perpendicular diaphragm. On the two sides of the diaphragm are photosensitive components. The value of resistance of the photosensitive components varies with changes in sunshine. These two photosensitive components must be strictly symmetric. When the sunlight and the diaphragm are in a straight line incidence (i.e., the light rays are parallel to the plane of the diaphragm), the amount of sunshine falling on the photosensitive components on the two sides of the diaphragm is the same. If the light rays and the diaphragm form a certain angle, then the photosensitive component on one side of the diaphragm will be in the shade of the diaphragm; in this way, the amount of sunshine falling on the photosensitive components on the two sides of the diaphragm is different, and the resistance values are also different.

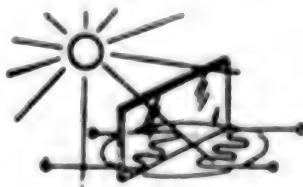


Figure 4.

Figure 5 shows the principle of the circuit. The motor bridge is connected to the output terminals of the two amplifiers. Because the movement of the solar tracking device is slow, therefore, a low wattage motor can be used to drive the light collector via a gear with a high variable speed ratio. When the diaphragm and the sunlight form a straight line, the resistance values of the two photosensitive components are the same. The input voltage of the input terminal of the same phase of the LM380 and the input voltage of the input terminal of the reverse phase are the same. The output is about half the power source voltage. Because the input terminals of the same phase and reverse phase of the two LM380 are connected, therefore, the output of the two LM380 is the same, the electrical potential on the two sides of the motor is the same, a driving current cannot be obtained and the motor is stationary. The LMR potentiometer is used to regulate the unbalanced voltage at the output terminals of the two amplifiers when the input is the same. If the diaphragm and the sunlight are not in a straight line, the amount of sunshine falling on the photosensitive components on the two sides of the diaphragm is different, the resistance value is not the same, and the same phase input and the reverse phase input of the selected amplifier are not equal, thus causing the output voltage to rise or fall. According to the method of connecting the circuit, when the output voltage of a certain amplifier rises, the output voltage of the other amplifier drops, a difference in electrical potential on the two sides of the motor is formed and this causes the motor to turn. We can adjust the difference value between the angle of incidence of sunlight and the light collecting device so that the light collecting ability is maximum. The 4.7K potentiometer is used for adjusting sensitivity. The higher the position of its movable arm, the higher the sensitivity of the circuit.

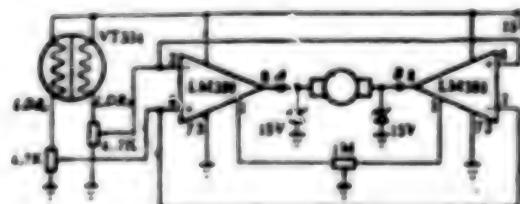


Figure 5.

The drive current of the circuit shown in Figure 6 is relatively large: it can reach 5A. We can connect the output terminals A and B of the two amplifiers of the circuit shown in Figure 5 respectively to the input terminals A and B of the circuit shown in Figure 6.

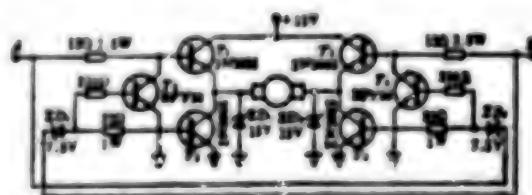


Figure 6.

Because the solar tracking system must track the horizontal azimuth of the sun and also the elevation of the sun, therefore, there must be two sets of drive circuits, and two motors are used to separately control the horizontal revolution and the elevation of the light collector.

(Translated from ELECTRONIC ENGINEERING, March 1981, by Xu Jintian [1776 6855 3944])

#### A Simple Digital Frequency Multiplier With a Constant Frequency Band Width Ratio

This circuit is composed of a TTL inverter and a NAND gate. It includes two units. The upper unit produces an output pulse at the leading edge of the input pulse. The lower unit produces an output pulse at the after-edge of the input pulse. These two output pulses are combined in the NAND gate. We can utilize the potentiometer  $R_1$  to adjust the frequency bandwidth ratio of the output pulse to the needed value (maximum of 50 percent).

The frequency bandwidth ratio of the output pulse of the ordinary frequency multiplier varies in the opposite direction to the change in frequency. This is because as the input frequency increases, the charging voltage on the capacitor  $C_2$  lessens, and as the input frequency drops, the voltage on  $C_2$  increases. In this circuit, because of the addition of transistors  $BG_1$ ,  $BG_2$  and the integrator  $R_1$   $C_1$ , the charging rate on  $C_2$  increases or decreases proportionally, thus canceling the effect of cyclic change of the input pulse. When the frequency of the input signal varies in such a large range from 1 to  $10^4$  Hz, the frequency bandwidth ratio of the output pulse can be maintained at a constant.

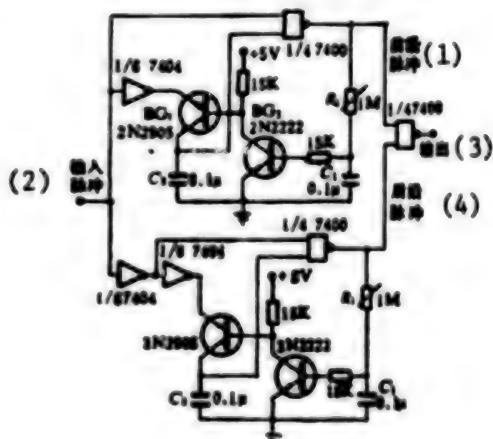


Figure 7.

Key:

(1) Leading edge pulse  
(2) Input pulse

(3) Output  
(4) After-edge pulse

(Translated from ELECTRONICS, April 1980, by Mao Yimin [5403 0001 3046])

## National Broadcasting and Television Industry Bureau Holds National Conference on Transistorized Radio Technology

The radio is one of our nation's 10 major consumer goods items and has developed rapidly in recent years. In 1979 annual production reached over 13 million sets, and in 1980 it reached 30 million sets. During the first half of this year, it reached 19.17 million sets, and it is estimated that by yearend it will reach 40 million sets. Users already own about 140 million sets, an average of 1 for every 7 persons.

The present direction of development of radios is toward further improving the quality of sound, improving the design, increasing the variety, reducing the cost, and producing more and better transistor radios. Here, the problem of conserving energy is involved. At present, the whole nation has 14.5 million electron tube radios; calculating on the basis of the consumption of 45 watts of power per unit, with all of them turned on simultaneously, the power consumption would reach 650,000 kilowatts, equivalent to the generating capacity of the Xinanjiang Hydroelectric Power Station. The consumption of electric power is very sizable. For this reason, the National Broadcasting and Television Industry Bureau held a "National Transistor Radio Technology Conference" 20 to 27 July in Beijing centered around questions of improving the quality of sound, conserving energy and reducing the cost. The conference asked that these problems be solved within 2 years in order to produce superior quality products and to supply the market by doing research work well, further unifying ideology, further improving understanding, further improving confidence and grasping the replacement of electron tube radios by transistor radios as the key work.

Before the conference, a unified performance and sound test of 120 transistor radios consisting of 62 models developed by 49 manufacturers in 18 provinces and cities throughout the nation was conducted, and the results were compared with the performance of electron tube radios (Hongdeng 711-3 model and Haiyan D322-1 model). As a result, 11 radios were found to have superior performance (the Hongdeng 711-2B model produced by the Second Shanghai Radio Plant, the Hangzhou JTD-2 model produced by the Zhejiang Xiaoshan Radio Plant, the Bao-nihua TS-3B1 model produced by the Jiangsu Nantong Radio Plant, the Xiongmao B627 model produced by the Nanjing Radio Plant, the Meiying 802 model produced by the First Chongqing Radio Plant, the Mudan 1441 model produced by the Beijing Radio Plant, the Beihua T8073 model produced by the Jiangsu Yangzhou Radio Plant, the Xlandi ST1 model produced by the Chongqing Radio Plant, the Yinque T121 model produced by the Jiangsu Wuxi County Radio Plant, and the Ximei T212 model produced by the Changzhou Fourth Radio Plant). Among these, the first five have already reached the sound quality of electron tube radios (actual performance is listed in the table).

Each of the 120 sample radios was large and had a beautiful large or medium sized wooden case; the number of transistors used varied from 8 to 20; generally they all had 2 to 4 wavelengths and all used alternating current as the power source; the speakers were 6.5 inches or 5 x 7 inches; they were all equipped with volume controls and recording and microphone sockets, and their output power was 3 to 10 watts.

Major Performance Indices of Five Sample Radios

(8) 指 标	(1) 品号 型号 红 灯 711-3	(2) 灵 敏 度 电 管 红 灯 711-2B	(3) 灵 敏 度 红 灯 711-2B	(4) 杭 州 JTD-2	(5) 宝 花 TS-3B1	(6) 红 灯 2T-123B	(7) 雄 马 B627
(9) 灵敏度(mV/m) $S/N = 20\text{dB}$	0.19/0.36	0.29/0.37	0.15/0.26	0.2/0.5	0.17/0.35	0.28/0.34	
(10) 偏置比(dB) 10mV/m	44.76	36.34	45.6	35.58	42.7	57.5	
(11) AGC(dB)	31.5	48.65 阻塞0.5dB	(12) 47.95	43.2	45	35.14	
(13) 选择性(dB) $+/-9\text{KHz}$	40.9/32.04	23.6/17	27.28/35.65	25.8/22.09	42.7/25.2	17.08/24.9	
(14) 通频带(KHz)	7.24	8.53	5.00	6.94	7.63	10.27	
(15) 偏调失真(%) $\pm 6\text{KHz}$ 内	2.8/12.2	3.25/8.2	5.4/14	3.4/6.4	2.4/7.6	2/3.6	
(16) 有用功率(W) (失真10%)	3.61	3.92	7.03	5.78	4	6.25	
(17) 音频互调失真(%)	11.5	5.8	0.55	2.6	4		
(18) 电能消耗(VA) 无信号/ 1W输出	38.06/38.5	5.5/5.72	3.06/7.04	15.4/16.3	7.15/8.68	7.7/10.56	
(19) 声失真(%)	2/10	2.2/13.5	4/10	3.5/5.8	1.6/11	1.3/7.2	
(20) 平均声压(μbar)	15.9	12.6	16	20.9	15.9	16	
(21) 转换速率(V/μS)	0.14	0.4	0.185	0.21	0.113	0.314	
(22) 静态互调失真(%)	5.34	0.63	0.64	2.1	2.1	2.1	
(23) 整机声频响(Hz)	80~6300	55~7000	70~5200		40~7000	70~7000	

Key:

- 1 Brand and model
- 2 Electron tube Hongdeng 711-3
- 3 Hongdeng 711-2B
- 4 Hangzhou JTD-2
- 5 Baoshihua TS-3B1
- 6 Hongdeng 2T-123B
- 7 Xiongmao B627
- 8 Indices
- 9 Sensitivity (mV/m)  $S/N = 20\text{ dB}$
- 10 Signal-noise ratio (dB) 10 mV/m
- 11 AGC (dB)
- 12 Blocking 0.5 dB
- 13 Selectivity (dB)  $+/-9\text{KHz}$
- 14 Communications frequency band (KHz)
- 15 Bias distortion (percent) within  $\pm 6\text{ KHz}$
- 16 Effective power (W) (Distortion 10 percent)
- 17 Distortion of acoustic frequency modulation (percent)
- 18 Electric power consumption (VA) No signal/1W output
- 19 Sound distortion (percent)
- 20 Average sound pressure ( $\mu\text{ bar}$ )
- 21 Conversion speed (V/ $\mu\text{ S}$ )
- 22 Instantaneous modulation distortion (percent)
- 23 Sound frequency volume of the whole set (Hz)

(Staff correspondent))

## Viewing the Trend in the Development of Microwave Technology on the Basis of the 1981 International Microwave Conference

A "1981 International Microwave Conference" sponsored by the Institute of Electrical and Electronic Engineers was held in Los Angeles 15-19 June 1981. The Fourth Ministry of Machine Building sent three comrades, Lin Jinting [2651 6855 1656], Liu Xian [0491 6897] (of the Nanjing Solid Devices Research Institute) and Li Haomo [2621 3185 2875] (of the Hebei Semiconductor Research Institute) to attend this conference; they presented five papers, entitled "Current Development of Microwave Semiconductor Devices in China," "The Planar Low Noise GaAs Single Chip Microwave Amplifier," the "4 GHz GaAs Field Effect Transistor Low Noise Amplifier," the "12 GHz Direct Telecast Satellite Receiver," and the "40 to 60 GHz Gunn Diode and Its Oscillator," which were well received by the conference.

At the conference, a total of over 160 papers was presented on a broad range of topics--more than 20 topics. Among them, about half of the papers were on microwave semiconductor devices, integrated circuits and their applications. Over 60 papers were presented by nations other than the United States (mostly Japan, followed by Western Europe and China).

During the conference, a products exhibition presented by over 140 microwave companies was held; technology and trade were closely joined together.

Looking at the conference, the following technological trends are worth noting.

1. Microwave single chip integration (mainly integration on gallium arsenide single chips) is the major direction of development in the microwave field. The applicability of single chip microwave integration has already been included on the daily agenda. The technological level of microwave integration has been greatly elevated, and broad chip broad band low noise fourth grade FET amplifier has an operating frequency of 0.2 to 10 GHz,  $N_p < 4$  dB,  $G > 12$  dB; the operating frequency of the power FET single chip feedback amplifier is 2 to 12 GHz,  $G = 5.4$  dB,  $P_{out} \approx 0.5$  W. Development of research in gallium arsenide single chip integration is centered on low noise reception, power emission, billion-bit (used for microwave digital communications) high-speed circuits and digital circuits in computers, and charge coupled devices.
2. Research work in the gallium arsenide field effect transistor (including low noise and power tube) and its application are the popular pursuits currently. At present, the standards of the devices are very high, the  $N_p$  of the low noise FET is 0.58 dB at 4 GHz and 1.20 dB at 12 GHz. The output power of the GaAs FET is 0.55 W below 26 GHz, 100 mW at 30 GHz, and 215 mW at 57 GHz. Whether it is a low noise device or a power device, its grid length can be controlled well within 0.5 to 0.6  $\mu$ , the shortest reaching 0.25  $\mu$ . The GaAs FET of 30 GHz of power produced by Mitsubishi of Japan was manufactured directly from the electron beam.
3. Research in millimeter wave was given a lot of emphasis. A lot of research work centered on the several major frequency ranges of 30 to 40 GHz, 50 to 60 GHz, and 94 GHz. At the same time, definite work has been carried out in the

100 to 200 GHz, 200 to 300 GHz and intersecting ranges of the submillimeter wave and light waves. Work on the application of whole mechanical units mainly involved the locator, satellite communications, the short range radar, the microwave radiation counter and the civilian Doppler radar.

4. Computer-aided design (CAD) has also been successfully used in the design of microwave single chip integrated circuits, wave filters and microwave networks. Most of the microwave testing instruments were automated with the addition of microcomputers.

5. Research in the civilian use of microwave received a great deal of emphasis. For example, Japan's Mitsubishi, NHK, and some U.S. companies have carried out a lot of research in velocity measuring radars of the X frequency range, Ku frequency range and millimeter frequency range used for automobiles, microwave communications, and direct telecast satellite reception.

#### Tuning Fork Light Chopper

In infrared detection and other photoelectric systems, when continuous light signals have to be converted to alternating light signals, a light chopper must be used. The tuning fork light chopper trial manufactured by the state-run Hong Yun Instruments Plant is superior to the commonly used belt and hole disk driven by a motor--a modulating disk at present. It uses a transistor oscillator circuit to excite a highly steady mechanical vibration in the tuning fork harmonic oscillator, and utilizes the opening and closing movements of two metallic plates on the two ends of the tuning fork to pass or intercept light to achieve the goal of light chopping. It has a simple oscillator circuit, the precision of the light chopping frequency is stable, it can operate continuously for long periods, it is small in size and light in weight, it consumes less power, and it is convenient to use.

The external dimensions and the lead-out line symbols of the tuning fork light chopper (taking 1,000 Hz as an example) are shown in the first diagram in Figure 8. Its oscillator circuit is shown in the second diagram.

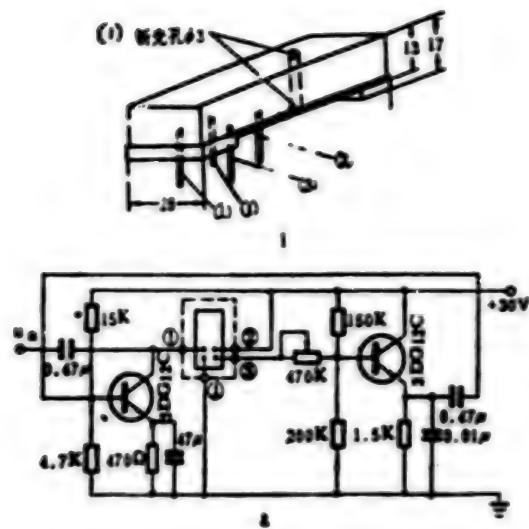


Figure 8.

Key: (1) Light chopping aperture  $\phi 3$

The major technical specifications of the tuning fork light chopper are as follows:

1. Light chopping frequency: 100 to 1,000 Hz;
2. Precision of the light chopping frequency:  $\leq 4 \times 10^{-3}$ ;
3. Light chopping area:  $\geq 0.5 \text{ mm}^2$ ;
4. Startup oscillation time:  $\leq 1 \text{ second}$ ;
5. Continuous operation time:  $\geq 8 \text{ hours}$ ;
6. Weight (taking 1,000 Hz as an example): About 75 g.

(Su Guangping [5685 1684 1627])

### The JCB-1 Laser Scan Deformation Gauge

This gauge was developed by the Liaoning Provincial Electronic Technology Research Institute. It is suitable for use in measuring tensile deformation of metals that are difficult to melt and brittle materials when heated to less than 3,000°C. It utilizes laser scanning to scan the sample being measured continuously and ceaselessly, thus realizing noncontact automatic measurements of tension of the test sample. The measured data are precise and reliable; secondary errors introduced by the contact method are eliminated. It provides a new method of measurement for testing mechanical properties of high-temerature materials.

The major technical properties are:

1. Standard variable length of the gap of the test sample: 25 to 50 mm;
2. Dynamic range of measurement: 0 to 20 nm, range of precise measurement: 0 to 5 nm;
3. Precision of measurement: The absolute error within the distance of extension of 0 to 5 mm is not greater than 0.02 mm;
4. Temperature of suitable test samples: 0 to 3,000°C;
5. Sampling speed: 600 points/second in fast shift;  
50 points/second in slow shift;
6. Speed of laser beam scanning lines: 180 meters/second.

(Wu Shulin [0702 2579 2651])

### The BG-II Portable Low Illuminometer

The BG-II portable low illuminometer trial produced by the state-run Nanjing Huadong Electron Tube Plant can directly measure the illuminance of medium intensity to extremely weak intensity light ( $10^3$  to  $10^{-6}$ lx) and the luminance, intensity, contrast, and reflective index within this range. The illuminometer consists mainly of a light receiver, a highly sensitive micro-galvanometer, a highly stable high-voltage power source and an overload automatic protection device. It has a broad range of measurements, a high sensitivity ( $3 \times 10^{-7}$ lx), and a beautiful exterior; it is small and light in weight; it uses both alternating and direct current, and it is portable. It can be used for microphotometric research, microphotometric measurements, testing of night vision and dim light photographic devices, dim light calibration for testing equipment, night time field experiments and night training of troops.

(Cheng Guolai [4453 0948 0171])

### Polyoxy Glue CJ-915

The Chenguang Chemical Engineering Research Academy (in Fushun County, Sichuan Province) of the Ministry of Chemical Industry has successfully developed polyoxy glue CJ-915. This type of glue retains the superior adhesive properties of the polyoxy resin series and also manifests rubbery elasticity. The glue consists of two groups, group A and group B. It can solidify at room temperature, it can be easily prepared, its operating viscosity is low, its useful

life is long, and its release of heat during solidification is low, smooth and slow. Its solidified substance is light in color and transparent, its stability over time is good, and the surface of the solidified substance maintains a good luster. The glue has a low toxicity, a low degree of irritation, and it is not harmful to the user.

This glue is a good adhesive for metals and plastics, especially when used to glue together different types of materials with a large difference in their coefficients of thermal expansion, such as gluing metal and plastics, metal and glass, and ceramics together (a certain factory used it to glue together piezoelectric ceramic sounding plates; when the ceramic plate was bent many times in one direction, the ceramic plate fragmented but did not break off); it is also suitable for gluing soft materials, including certain plastics, and the result of gluing organic glass is also very good. It can be used in anti-corrosive solvent-free coatings, the repair of concrete structural members in civil engineering construction, casting of certain electronic components, packaging and sealing, and filling and gluing of optical components which have a strict stress requirement.

(Tian Xinghe [3944 5281 0735], Gao Fushen [7559 2421 3947])

9296  
CSO: 4008/32

APPLIED SCIENCES

ZD-2000 CHINESE CHARACTER TERMINAL DEVELOPED

Taiyuan SHANXI RIBAO in Chinese 29 Nov 81 p 1

[Article: "ZD-2000 Chinese Character Video Display Terminal Successfully Developed"]

[Text] The state-run Jianshan Machinery Plant has successfully developed a "ZD-2000 Chinese Character Video Display Terminal" (also known as Chinese Character Information Processing System). In the first half of last October, there was a prototype demonstration at the Nationwide Electronic Computer Exhibition in Beijing, which was highly acclaimed by party and state leaders as well as Chinese and foreign experts and professors in the field who regarded it as the best Chinese character intelligent terminal of its kind in China's current electronic computer system in terms of compact structure and wide application. By the end of last October, up to a thousand terminals had been placed on mail order by customers all over the country as well as East Germany and Yugoslavia.

The main functions of the "ZD-2000 Chinese Character Video Display Terminal" are as follows: It can be used as computer online terminal for inputting/outputting Chinese characters; it can be used as a stand-alone unit for editing, modifying and printing information in European languages or Chinese characters; it can be used as a communication terminal that can be tied into a telephone communication network; it can be used as a general purpose microcomputer.

The "ZD-2000 Chinese Video Display Terminal" can be used for production control, stock control, personnel/salary management, planning/statistics, processing reports, as well as Chinese character information indexing, and numerical computing, etc.

At present, the state-run Jianshan Machinery Plant is actively engaged in all kinds of preparation work, and expects to swing into batch production by next year.

9119  
CSO: 4008/48

Biology

AUTHOR: XIONG Yongzhou [3574 3938 0719]  
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ORG: Both of the Shanghai Institute of Cell Biology, Chinese Academy of Sciences

TITLE: "Effect of Trichosanthin on Different Kinds of Cultured Human Cells *in vitro*"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 3, Sep 81 pp 259-269

TEXT OF ENGLISH ABSTRACT: In order to verify the cellular specificity of injurious action of Trichosanthin, five kinds of cultured human cells (i.e., Hydatidiform mole cells, fetus renal cortex cells, decidual cells, HeLa cells, nasopharyngeal carcinoma cells and hepatic carcinoma cells) were submitted to the drug treatment, their morphological changes were observed and the cellular proliferation aspect of the hepatic carcinoma cells was also analyzed. Furthermore, the intracellular localization of Trichosanthin in decidual cells was described by using the indirect method of immunoenzyme technique at the microscopic level.

It is clear from the results that the susceptibility of these five kinds of cells to the drug was quite different. Among them, the trophoblast cells of the hydatidiform mole were the most sensitive cells, with as little as 1  $\mu$ g of the

[Continuation of SHIYAN SHENGWU XUEBAO No 3, Sep 81 pp 259-269]

drug per 3 ml medium being enough to cause them to degenerate. However, the other kinds of cells had some tolerance to the drug action, and no prominent degeneration appeared even when the drug concentration in the medium was increased up to 50  $\mu$ g per 3 ml. The experimental results of localization of Trichosanthin in the human decidual cells by enzyme immunocytochemistry pointed out that Trichosanthin could be detected in the cytoplasm, but it was not present in the nucleus. Although there was a certain degree of inhibition on the proliferation of hepatic carcinoma cells, the effect was reversible after a recovery period and the cells recommenced to normal proliferation. Hence, all these results further support the viewpoint that Trichosanthin has a certain degree of cellular specificity of injurious action on syncytiotrophoblast cells.

AUTHOR: LUO Mujiang [5012 1970 1730]  
YAO Zengxu [1202 2582 1645]

ORG: LUO of Hunan Medical College; YAO of the Shanghai Institute of Cell Biology, Chinese Academy of Sciences

TITLE: "The Growth Property of Human Nasopharyngeal Carcinoma Epithelioid Cell Line (CNE): Insensitivity to High Temperatures in Tissue Culture"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 3, Sep 81 pp 317-321

TEXT OF ENGLISH ABSTRACT: The CNE cell can multiply and be passaged at 41°C more than 80 days and 10 generations in tissue culture. When compared with CNE cells cultured at 36°C, the cell population at 41°C grew more rapidly from the third to the sixth day, and in keeping with the former property, population doubling times at 36°C and 41°C were 55 hours and 33 hours respectively. Regarding the plating efficiency and cell density, the data obtained at 36°C were 48.9 percent,  $48 \times 10^5/\text{CM}^2$  and at high temperatures were 12 percent,  $1.9 \times 10^5/\text{CM}^2$ . The CNE cell can even multiply at 42°C, but the growth rate was apparently reduced. The cell population enlarged only fivefold until the sixth day in the culture as compared with the initial inoculum, and then prominently reduced.

[Continuation of SHIYAN SHENGWU XUEBAO No 3, Sep 81 pp 317-321]

There were no observable morphological abnormalities of the CNE cells cultured at 41°C from 3-20 days except for the slight enlargement of the cell nucleus, but a much more giant nucleus cell and multinucleated giant cells appeared after being cultured at 42°C for three to eight days, showing marked defects in karyokinesis and cytokinesis.

9717

CSO: 4009/187

Dams and Engineering

AUTHOR: CHU Haining [0328 3189 1380]  
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CHI Xuetong [3069 1331 4547]

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TITLE: "A Method of Strain Observation for Stone Masonry Arch Dams"

SOURCE: Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 4, 1981 pp 3-16

TEXT OF ENGLISH ABSTRACT: Since the stone masonry arch dam is a common type of dam in water conservancy projects, it is important to provide an appropriate method for observing stress in the body of the dam. First this paper presents a laboratory experiment, theoretical analysis and field test, which are all necessary for arch dam observation. Then, the paper points out that it is practicable to calculate the dam stress from dam strain data measured by strain meters pre-embedded in cut stones of the arch dam. The test shows that both the creep deformation of stones used in the Nanqi Dam (in Fujian Province) and the creep effect of 10-month-old cement mortar are negligible. As a result, Hooke's Law for elastic bodies can be applied in calculating the stress based on the measured strain data.

AUTHOR: WANG Desheng [3769 1795 4141]  
OU Liangjian [2962 5328 1696]

ORG: Both of the Engineering and Design Bureau, Air Force Logistics Department, PLA

TITLE: "BWG1 Inductance Sensor Intended for Measuring Displacement"

SOURCE: Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 4, 1981 pp 17-23, 16

TEXT OF ENGLISH ABSTRACT: A frequency shift displacement measuring device, proposed in this paper, comprises an inductance sensor and a small oscillator. The sensor, the basic element of the unit, is made up of a frameless stepped coil and a monolithic ceramic capacitor as a temperature compensation element. It possesses broad linear response, high stability, sensitivity and accuracy, and high resistivity to interference. In addition, it is simple in structure, resistant to vibration, low in cost and easy to install. As a result, it is suitable for measuring displacement due to static or dynamic load.

AUTHOR: CHEN Guangdan [7115 0342 2481]  
LI Lixian [2621 5461 0103]

ORG: Both of the Zhejiang Water Conservation and Hydropower Sciences Research Institute

TITLE: "Analysis of Internal Stresses Observation Data for Earth Dams"

SOURCE: Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 4, 1981 pp 24-40

TEXT OF ENGLISH ABSTRACT: In this paper, an analysis of internal stress observation data for several earth dams in Zhejiang Province is presented. The data obtained include pore pressure, total stress and effective stress of earth fill during the construction stage, and pore pressure of clay core after finishing construction and during the reservoir-filling stage. Some conclusions are deduced for reference.

A differential resistance type piezometer and vibrating wire type earth pressure cell are employed in testing.

AUTHOR: ZHANG Linnan [1728 2651 2809]

ORG: Northeast Survey and Design Academy, Ministry of Electric Power Industry

TITLE: "Measurement of Dam Inclination with 'Optical Split-image Leveling Instrument'"

SOURCE: Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 4, 1981 pp 48-50

TEXT OF ENGLISH ABSTRACT: The testing and research work is done to find out the possibilities of using the "Optical Split-image Leveling Instrument" to measure the inclination of a dam, and a special account is given of the structure and special baseplate of the instrument as well as the calculation of inclination value. It is pointed out that the advantages of measuring the inclination of a dam with this instrument are: accuracy in measuring, easy handling and that few workers are required to operate it.

AUTHOR: KONG Fanling [1313 0416 3781]  
ZHANG Shiying [1728 0013 5391]  
HOU Xianhua [0186 3759 5478]

ORG: All of the Rock and Soil Engineering Research Institute and the Water Conservation and Hydropower Sciences Research Institute

TITLE: "Preparation of Sample for Earth Fill Triaxial Test"

SOURCE: Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 4, 1981 pp 51-54

TEXT OF ENGLISH ABSTRACT: In carrying out a triaxial test for earth fill, it is a common practice to prepare a sample with remolded soil in the laboratory. The quality of the sample preparation directly affects the test results.

This paper introduces the improvement of the instrument used in the static loading method for preparing cohesive or noncohesive soil samples and recommends the preparation of a sample of noncohesive soil which contains a small amount of fine-grained soil.

AUTHOR: ZHOU Zhubao [0719 4639 1405]

ORG: Xiangtan University

TITLE: "Analysis of Observed Stresses of Reinforcement in Reinforced Concrete Structures by Stepwise Regressive Method"

SOURCE: Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 4, 1981 pp 55-61

TEXT OF ENGLISH ABSTRACT: This paper presents ideas and procedures for analysis of observed stresses of reinforcement by the stepwise regressive method. On this basis, an example of its application is given in detail. It is shown that this method is a useful tool for analysis of observed stresses of reinforcement.

9717

CSO: 4009/194

Engineering

AUTHOR: CHEN Jiading [7115 1367 7844]  
LUO Detao [5012 1795 3447]

ORG: Both of the Department of Naval Architecture

TITLE: "Analysis of Spread Mooring and Positioning System"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 1-11

TEXT OF ENGLISH ABSTRACT: The calculating method dealing with restoring force and line tensions in spread mooring and positioning system of a floating drilling rig is presented with its computer flow diagram which is applicable to a single line type, i.e., all chain or all wire rope, or a combination of the wire rope-chain system with or without clump weight. The calculating results of different systems are represented by characteristic curves for comparison.

AUTHOR: PAN Weiwen [3382 0251 2429]  
ZHANG Ruilin [1728 3843 7792]

ORG: Both of the Department of Naval Architecture

TITLE: "Block Coefficient of Full Containerships"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 13-19

TEXT OF ENGLISH ABSTRACT: In this paper, the relationship between the block coefficient of containership and the number of containers aboard ship is discussed. Some parameters, which provide the major influence on "Ship-Containers," are presented in systematic variables. Then, the 288 ship's forms are composed. The results, based on a great deal of calculation with computers, are used to analyze the block coefficient of containership. Finally, a simple block coefficient formula is given which may be used in the containership design at the preliminary stage.

AUTHOR: ZHOU Chaojun [0719 6389 7486]  
LIU Dingyuan [0491 7844 0337]

ORG: Both of the Department of Naval Architecture

TITLE: "Probe into Surface Method for Mathematical Design of Hull Lines"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 21-31

TEXT OF ENGLISH ABSTRACT: The paper describes the surface design of ship hull forms with a computer. According to principal dimensions and ship form coefficients, and consulting parent ships or sketches of contour lines of the design ship, the hull surface is cut into several surface patches which are defined by the bicubic parametric equations. The surface patches must be continuous at the positions and tangent planes. A fair, artistic and practical ship surface is formed by the linking up of the surface patches and by suitable modification with a set of sighting factors. Ship's lines that may satisfy the original hydrostatic properties, such as prismatic coefficients, longitudinal center of buoyancy, etc., can be obtained. These ship lines can be selectively adopted by naval architects in their practical work.

AUTHOR: ZHOU Faqing [0719 3127 3237]

ORG: Department of Power Machinery Engineering

TITLE: "Reliability Analysis of the Protective Safety System of a Nuclear Power Plant"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 33-41

TEXT OF ENGLISH ABSTRACT: This paper analyzes the reliability of the protective safety system of a nuclear power plant from the point of view of the probability theory, makes the calculation and comparison of reliability of the single-channel, parallel-channels, multiplex configuration channels, K-out of-N channels, multi-out logic, standbys that are always used in the protective safety system of a nuclear power plant. It is indicated that multiplex configuration channels are ideal logic models of the protective safety system of a nuclear power plant.

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ORG: All of the Department of Materials Science and Engineering

TITLE: "A Study of Underwater Thick Plate Cutting Technology"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 43-52

TEXT OF ENGLISH ABSTRACT: Having analyzed a great many technological experiments in underwater thick plate cutting and oscillograms of cutting arc voltage and current taken during the experiments, the authors have found some characteristics of wire-cutting fusion process; the analytic results suggest two patterns of underwater consumable electrode thick plate cutting--the sawing type and the digging type.

This paper provides a theoretical analysis of the relationship between the melting speeds of cutting wire, the parent metal and the cutting parameters of the sawing-type cutting process. It also studies the techniques for increasing the thickness of plates being cut and their limitations.

[Continuation of SHANGHAI JIAOTONG DAXUE XUEBAO No 4, Nov 81 pp 43-52]

The last part of the paper is devoted to the introduction of the technological experiments made with different parameters, such as types of water ejection and water pressure. It also deals with the measures taken to improve the quality of underwater cutting, which make it possible to cut carbon steel plates of more than 30 mm (up to 45 mm) in thickness with a consumable electrode water jet technique.

AUTHOR: WANG Tong [3769 4827]

ORG: Department of Mechanical Engineering

TITLE: "Predicting Bulk Temperatures in Gear Teeth by the Finite Element Method"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 53-71

TEXT OF ENGLISH ABSTRACT: The gears operating at high speed and heavy loads have to endure more heat and higher temperatures. Gear temperatures have an effect on the properties of lubricants, the scuffing on gear surfaces and the heat deformation of gears. Therefore, predicting the bulk temperatures in gear teeth is very important.

The temperature distribution in spur gears operating in a state of thermal equilibrium can be calculated using the finite element method. With the help of proper suppositions the calculating process may be simplified. The bulk temperatures in gear teeth can be predicted once the heat transfer coefficients and frictional heat input are estimated. A brief introduction to the methods of estimating heat transfer coefficients and frictional heat input are also presented.

In this paper, the temperature of a pair of meshing gears has been calculated as an illustration of how the bulk temperature in spur gears is predicted.

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SHEN Linlin [3088 7207 7207]

ORG: HUA and GAO both of the Department of Precision Instruments; JIANG and SHEN both of the Shanghai First Medical College

TITLE: "Analysis of Rheoencephalogram in Frequency Domain"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 73-90

TEXT OF ENGLISH ABSTRACT: In this study, a new method of frequency spectrum analysis of the rheoencephalographic signals (REGS) is introduced. This method is based on the theory of linear system and ergodic stationary random process, with the FFT and stochastic data-processing being employed.

The results proved the correctness of theoretical analysis, and the characteristics of the elasticity of the brain blood vessels in the frequency domain were also obtained. This study provided a reliable basis for further investigation of the rheoencephalogram in the clinics.

AUTHOR: HONG Jiazen [3163 0857 2182]

ORG: Department of Engineering Mechanics

TITLE: "Nutation Synchronous Motion of a Free Gyroscope with an Annular Damper"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 91-98

TEXT OF ENGLISH ABSTRACT: The motion equations for a free gyroscope with an annular damper are established by application of the equations of the first order in normal form for the motion of the rigid body. The nutation synchronous motion of the gyroscope is discussed by the iteration method. The paper deals with the stability of the motion in detail and corrects a wrong result concerning nutation angle attenuation given in the referency by Koppen. The possibility of multi-valued critical angle from the nutation synchronous into the spin synchronous is demonstrated. The relations of the damping rate and the critical angle relative to the different parameters are given.

AUTHOR: HE Qiong [0149 4522]

ORG: Shanghai Baoshan Iron and Steel Works

TITLE: "A Revised Non-conforming Isoparametric Eight-node Three-dimensional Element"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 99-110

TEXT OF ENGLISH ABSTRACT: The incompatible isoparametric brick element with eight nodes is revised so that the patch test condition is fulfilled. The deduction and the respective formula of the algorithm are given in the paper. The numerical examples show that the results are satisfactory.

AUTHOR: GONG Benmin [7895 2609 3046]  
YE Yongda [5509 3057 6671]  
YING Xizhang [2019 6932 3864]

ORG: All of the Department of Applied Chemistry

TITLE: "Polyimide in Lithography"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 111-119

TEXT OF ENGLISH ABSTRACT: It is well known that polyimide has thermal stability, excellent insulating properties and resistance to radioactivity. The membrane is made of soluble polyamic acid, and then is changed into polyimide at high temperatures. However, the polyamic acid solution degrades easily at room temperatures and if the storage time is short. In addition, it has no photosensitivity and cannot form the images. Thus, its application is very limited in the electronics industry.

We found that the degradation of the polyamic acid could be prevented if the acid was in the solid state and that the behavior of polyimide was improved when the polyamic acid was fractionated. In addition, we selected suitable resistance for the masks and used wet or dry etching for the lithography of polyimide. The results were satisfactory. They will be of great use in the passivation and

[Continuation of SHANGHAI JIAOTONG DAXUE XUEBAO No 4, Nov 81 pp 111-119]

interlever insulation of semiconductor chips and, therefore, can be widely used in the electronics industry.

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ZHAO Zhengxiao [6392 2973 2699]  
XU Ziliang [1776 1311 0081]  
ZHU Yuqing [2612 3558 3237]

ORG: All of the Department of Electrical Engineering and Computer Science

TITLE: "System Design of DJS-053 Microcomputer Development System"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 121-134

TEXT OF ENGLISH ABSTRACT: This paper describes the DJS-053 microcomputer development system, the first sophisticated microcomputer system ever designed and made in China. This is a high-performance system based on Intel 8085A CPU, which provides 64K RAM and eight level priority interrupts. This system contains all necessary control and data circuitry to interface with CRT, standard ASCII keyboard, matrix line printer, EPROM programmer, dual single side double density floppy disk drive, cassette tape recorder, etc. Powerful system softwares, such as disk operating system, macro assembler, ICE (in-circuit emulator program) and several high-level languages (BASIC, FORTRAN, PL/M), make the system easy to use.

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YU Fei [6735 7378]  
HE Fangzheng [0149 2450 2973]

ORG: All of the Department of Power Machinery Engineering

TITLE: "The Testing Rig for the Four-stroke Diesel Engine Combustion Research"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 4, Nov 81 pp 135-143

TEXT OF ENGLISH ABSTRACT: In order to study the diesel engine combustion, a new testing rig has been designed and manufactured. It is modified from an ordinary multi-cylinder diesel engine. This testing rig can carry out only one cycle of the diesel like a rapid compression-combustion machine. The cylinder head of this rig is made of organic glass, through which the combustion phenomenon can be watched as a whole. On this rig there is a special inlet, outlet, injection and control system. In the experiment the moving and thermal conditions in the cylinder are the same as in a real engine, so that the testing results will reflect exactly the combustion phenomenon in the real diesel engine.

9717  
CSO: 4009/183

Geophysics

AUTHOR: PENG Jingcheng [1756 2529 6134]

ORG: None

TITLE: "Exploring Reef Facies Reservoirs in the Northern Part of the South China Sea"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 6, 15 Dec 81 pp 18-26

TEXT OF ENGLISH ABSTRACT: All necessary conditions for the formation and growth of bioherm exist in the northern part of the South China Sea. This paper is mainly devoted to the following five points: 1) the practical significance of exploring reef facies reservoirs; 2) the distribution of bioherm; 3) the category of bioherms and their seismic reflection characteristics; 4) the limitation in bioherm interpretation; 5) suggestions for future explorations of bioherm.

AUTHOR: YUE Caiwu [1471 1752 2976]

ORG: None

TITLE: "The Rock Density Characteristics and the Boundary Surface Determination in the Middle Part of Jiangxi Province"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 6, 15 Dec 81 pp 50-58

TEXT OF ENGLISH ABSTRACT: After a comprehensive analysis of density data obtained from more than 15,000 rock specimens gathered from the middle part of Jiangxi Province, the boundary surfaces of rock density were determined, which provides a reliable basis for the data interpretation of oil gravity reconnaissance in this region. Fairly good results have been achieved.

AUTHOR: ZHOU Shizhong [0719 0013 1813]

ORG: None

TITLE: "A Suggestion for Improving Seismic Exploration in Yunnan, Guizhou and Guangxi Provinces"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 6, 15 Dec 81 pp 97-102

TEXT OF ENGLISH ABSTRACT: The use of the crooked line multiple coverage technique in the mountainous areas of Yunnan, Guizhou and Guangxi has not brought about marked improvement of the quality of seismic data in the region. There are two reasons for that: first, the processing programs still leave something to be desired; second, the seismic crews have not worked out corresponding measures in the course of collecting seismic data, thus resulting in high trace gather moveout in surface element common reflection points. In this paper the factors causing trace moveout are analyzed, and the method for eliminating these influence factors is put forward.

9717

CSO: 4009/182

Lasers

AUTHOR: SHAO Ziwen [6730 1311 2429]  
YUE Chuanhua [1471 0278 5478]  
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ORG: SHAO, YUE and MA all of the Shanghai Institute of Laser Technology;  
WANG Pengfei, WU, WANG Gongjun and QI all of the Shanghai Dyestuff Research  
Institute

TITLE: "Tunable Properties of a New Efficient Laser Dye DCM"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 1-3

TEXT OF ENGLISH ABSTRACT: The characteristics of laser dye DCM, such as tuning range and peak wavelength in different solvents and at several concentrations, have been studied experimentally in detail. The conversion efficiency of DCM with nitrogen laser excitation is as high as that of Rhodamine 6G.

AUTHOR: WU Zhengliang [0702 2973 0081]  
YE Lin [5509 7207]

ORG: Both of the Shanghai Institute of Optics and Fine Mechanics, Chinese  
Academy of Sciences

TITLE: "Synthesis of Substituted 7-Amino Coumarins and Their Spectral and Lasing  
Behavior"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 4-7

TEXT OF ENGLISH ABSTRACT: A number of substituted 7-amino coumarins, C311, C47,  
C102, C152 and C481, have been synthesized. Their spectral and lasing behavior  
has been measured. The data obtained in our experiments show that substituted  
7-amino coumarins have the advantages of high efficiency, broad tunable band and  
high chemical stability. The effects of substitution on the behavior are also  
discussed.

AUTHOR: XU Shenchu [1776 1957 0443]  
LIU Shou [0491 1343]

ORG: Both of the Laser Research Laboratory, Department of Physics, Fujian Teachers' University

TITLE: "White-light Reconstruction Holography Improved with Astigmatism"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 8-12

TEXT OF ENGLISH ABSTRACT: Ordinary image-plane holography requires the reconstructed image to straddle the hologram, thus the image in front of the hologram causes visual confusion.

This paper describes our experiments using non-paraxial astigmatism theory to make the white-light reconstructed image on the image-plane holography appear behind the hologram, thus avoiding visual confusion. All conditions for the experiments and the results are given in detail. Using this method, we have obtained a clear, bright, speckle-less white-light reconstructed stereoscopic image, located behind the hologram.

AUTHOR: LU Kecheng [0712 0668 6134]  
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ZHANG Jinying [1728 6855 5019]  
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ORG: All of Nankai University

TITLE: "Experimental Investigation on the Discharge Noise for He-Ne Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 13-15

TEXT OF ENGLISH ABSTRACT: This paper reports the experimental investigations on the discharge noise for He-Ne lasers. A lot of noise phenomena have been observed within the range of 0-300 kHz by changing the tube structure, gas pressure and discharge current of the laser. The relation between noise and moving striation is also discussed. Finally, some methods for lowering the discharge noise are suggested.

AUTHOR: YU Jinzhong [0151 6855 0022]  
ZHUANG Wanru [5445 1238 1172]

ORG: Both of the DH Laser Research Group, Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Long Lifetime  $Al_xGa_{1-x}As$ -GaAs DH Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 16-19

TEXT OF ENGLISH ABSTRACT: The structure and characteristics of  $Al_xGa_{1-x}As$ -GaAs DH lasers are given in this paper. The accelerated aging test at elevated temperatures shows that  $E_a = 0.75 \pm 0.05$  eV and the lifetime of the devices will be over  $8 \times 10^6$  hrs.

AUTHOR: ZHU Peiran [2612 3099 3544]  
ZHU Wensen [2612 2429 2773]  
ZHAO Yuying [6392 3768 5019]

ORG: All of the Institute of Physics, Chinese Academy of Sciences

TITLE: "Isotopically Selective Dissociation of  $BCl_3$  Molecules in a Strong Infrared Laser Field"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 20-23

TEXT OF ENGLISH ABSTRACT: The experimental dependence of isotopically selective dissociation of  $BCl_3$  on the laser frequency, energy of each pulse and pulse number is investigated. The maximum dissociation rate of  $BCl_3$  molecules is found to be shifted by  $21 \text{ cm}^{-1}$  relative to its linear absorption spectrum in the direction of longer wavelengths. The enrichment coefficient of  $^{11}BCl_3$  is 5.8.

AUTHOR: DONG Hechao [5516 6320 6389]

ORG: Changchun Institute of Physics, Chinese Academy of Sciences

TITLE: "Ion-exchanged Glass Plane Optical Waveguide"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 24-25

TEXT OF ENGLISH ABSTRACT: Optical waveguides fabricated by immersing glass into molten AgNO<sub>3</sub>, are reported. This method is simple, easy and reproducible. The effective refractive index, thickness and loss of the optical waveguide were measured and the optical loss is less than 1 db/cm.

AUTHOR: LI Zhaolin [2621 0340 7207]  
FENG Baohua [7458 1405 5478]

ORG: Both of the Institute of Physics, Chinese Academy of Sciences

TITLE: "Study of Tuning of a Pulsed Dye Laser Forced Oscillator"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 26-29

TEXT OF ENGLISH ABSTRACT: Tuning characteristics of a pulsed dye laser forced oscillator are studied. Several experimental phenomena are explained by the third order mode-coupled equation deduced for dye lasers. The tuning method and the experimental results are also given.

AUTHOR: XIE Xiangsen [6200 4161 2773]

ORG: Shuguang Institute of Rubber Industry, Ministry of Chemical Industry

TITLE: "Inspection of Internal Flaws of Tires with Laser Holographic Interferometry"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 30-32

TEXT OF ENGLISH ABSTRACT: The formulas for strain quantity and fringe spacing based on the Bragg equation are derived. The relationship between fringe deformation and internal flaws is analyzed.

AUTHOR: YE Ronghua [5509 5554 5478]  
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ORG: Both of the Department of Physics, Nanjing University

TITLE: "Optical Addition and Subtraction of Characters by Grating"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 pp 33-36

TEXT OF ENGLISH ABSTRACT: The addition and subtraction of characters can be performed in a coherent optical processing system if a grating is used as a filter. In this paper, we describe the addition and subtraction of characters by a sinusoidal grating and a Ronchi grating. We compared the intensities of the first order image after addition by sinusoidal grating with those by Ronchi grating.

AUTHOR: WEN Jingsong [3306 2529 1529]  
WEI Gongyi [7614 0361 3015]

ORG: WEN of the Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences; WEI of the Beijing Computer Center, Chinese Academy of Sciences

TITLE: "The Space Correlation of Atmospheric Scintillation of the Laser Beam in Shanghai"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 10, Oct 81 p 37

TEXT OF ENGLISH ABSTRACT: In this paper, we use the model for turbulence intensity distribution in Shanghai to analyze the space correlation of atmospheric scintillation. Some characteristics of atmospheric scintillation under the condition of nonhomogeneous turbulence are quite different from those deduced from homogeneous conditions. The space correlation and the correlative scale of scintillation of the laser beam on a long path are discussed and some characteristics of those on short paths are also discussed.

9717

CSO: 4009/198

Nondestructive Testing

AUTHOR: YING Chongfu [2019 1504 4395]  
LI Mingxuan [2621 2494 6513]  
ZHONG Gaoqi [6945 7559 3823]  
et al.

ORG: All of the Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Analysis of the Effect of the Protective Diaphragm Thickness on the Waveform of a Piezoelectric Transducer"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 1-5

TEXT OF ENGLISH ABSTRACT: The thickness of the protective diaphragm of the piezoelectric transducer affects the waveform of the emitted ultrasonic pulse when the transducer is used as a transmitter, as well as that of the received electric pulse when the transducer is used as a transmitter/receiver. Numerical analysis is made for the case of step pulse excitation based on the Mason equivalent circuit.

AUTHOR: TAO Heng [7118 1854]

ORG: Shanghai Research Institute of Glassfiber Reinforced Plastics

TITLE: "Acoustic Emission for Proof Testing of GRP Vaulting Pole"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 6-10

TEXT OF ENGLISH ABSTRACT: Two phenomena in the acoustic emission (AE) from glass-fiber reinforced plastics (GRP) are: the partial reversibility during a second loading cycle and the continuation of emission after loading. Based on these phenomena, appropriate overloading conditions and hold-load time for testing can be determined. The AE of GRP vaulting pole ceases gradually under 5-10 percent overload and after a half-minute loading. The fatigue life of the vaulting pole is more than 500 times. The AE of GRP vaulting pole during increasing loading is mainly due to the microfracture at the interface between glassfiber and resin.

AUTHOR: ZHANG Yunfeng [1728 0061 7364]

ORG: Central Laboratory, Harbin Weijian Machine Plant

TITLE: "Exploration of Causes for Errors Experienced in NDT of Bond Strength"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 11-19

TEXT OF ENGLISH ABSTRACT: This article mainly discusses the method for nondestructive testing of bond strength, the measuring error of the resonance/impedance method. Experiments and applications have shown that sometimes the method provides considerable error, but no articles discussing this were known (to 1970). This article analyzes the causes of the composite errors through experimental data, puts forward the concept of the "Rhombic Chart," and makes simplified qualitative analysis.

AUTHOR: HU Shiyan [5170 0013 3508]

ORG: Emei Machinery Factory

TITLE: "Characteristics of Magnetic Particle Indication of Surface Flaws on Steel Parts"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 20-24

TEXT OF ENGLISH ABSTRACT: The cause and distribution of cracks resulting from casting, forging, welding, quench-hardening, grinding, as well as fatigue cracks, laps, hair line seams, etc., are discussed briefly. The features of magnetic particle indications of these flaws are also discussed.

AUTHOR: CHEN Qinglin [7115 1987 2651]

ORG: Sichuan Boiler Works

TITLE: "The Development of Leak Detection Techniques for Vessels"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 25-28, 55

TEXT OF ENGLISH ABSTRACT: Leak detection of vessels is a rapidly developing NDT technique. This paper summarizes the recent research and development of the methods and the associated equipment of leak detection.

AUTHOR: XIE Xiangsen [6200 4161 2773]

ORG: Shuguang Rubber Industry Institute, Ministry of Chemical Industry

TITLE: "Nondestructive Inspection of Internal Defects in Tires by Laser Holographic Technique"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 29-32

TEXT OF ENGLISH ABSTRACT: The laser holographic technique is a sensitive non-destructive method for the detection of internal defects in tires. This paper discusses the principle of the method, and gives some practical formulas for expressing the relationships of the area of delamination, fringe spacing, depth of delamination and sensitivity. They can also be used for assessing non-circular delaminations. The calculation shows that the detecting sensitivity is 2.5 mm delamination diameter at a load pressure of 1/10 atmosphere.

AUTHOR: JIN Shangzan [6855 1424 6363]  
LUO Xingli [5012 5281 0448]

ORG: Both of the Liaoning Power Station

TITLE: "A Discussion on Ultrasonic Inspection of Guard Ring for Rotor of Turbo-generator"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 33-37

TEXT OF ENGLISH ABSTRACT: This paper describes the detection of flaws in guard rings made of coarse-grained austenite steel by means of the wave edge of the minimum refraction angle transmitted by a transverse wave probe. A method for the calculation of sound paths is given.

AUTHOR: ZHANG Xuecheng [1728 1331 2052]

ORG: Sichuan Boiler Works

TITLE: "Study of the Flaw Location Method in Ultrasonic Weld Inspection by the Weld Width"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 5, 1981  
pp 38-42

TEXT OF ENGLISH ABSTRACT: This paper studies the characteristics of the flaw location method in ultrasonic inspection of weld in sheets by the weld width and the conditions under which the failure in flaw detection can be prevented. The choice of probe parameters is discussed and it is stated that 0.75 - 1.1 N will be the ideal acoustic path.

9717

CSO: 4009/190

Welding

AUTHOR: TIAN Xitang [3944 6932 0781]  
ZHU Hongguan [2612 7703 1351]  
XU Shipeng [1776 1395 7720]  
et al.

ORG: All of the Harbin Institute of Technology

TITLE: "Propagation of Weld Toe Cracks under Fatigue Load"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION]  
in Chinese No 3, 1981 pp 85-95

TEXT OF ENGLISH ABSTRACT: This paper contains experimental results of propagation rate distribution of a toe crack along its front under fatigue load. Experiments were performed on aluminum alloy (LY-12R) specimens simulating geometrical shape of a T-joint with toe crack. To obtain the crack propagation rate, markings were induced on fracture surface with changes in amplitude at specified numbers of fatigue load cycles. After complete fracture of the specimen, propagation rates were calculated by measuring the distance between markings on the fracture surface.

It is shown that (1) due to the stress concentration at the toe, the propagation rate of a toe crack in the direction of plate width is always higher than that of a crack of the same size in a flat plate, regardless of the crack depth;

[Continuation of HANJIE XUEBAO No 3, 1981 pp 85-95]

(2) additional moment, caused by angular welding distortion, increases the propagation rate of toe crack in the direction of plate width; (3) the stress intensity factor of a toe crack at the front near the surface is always higher than that of a crack of the same size in a flat plate under the same loading conditions; (4) compressive residual stress at the toe is effective in reducing the propagation rate of toe crack; (5) the length of a crack originating from a toe crack when its vertex reaches the back surface of the plate is much greater than the final length of a part-through crack of the same size originating from a flat plate when the plate is penetrated through under the same loading conditions. This should be taken into full account in designing pressure vessels on the principle of "leak before break."

AUTHOR: ZHOU Shiquan [0719 4258 3123]

ORG: Wuhan Boiler Factory

TITLE: "Study of the Mechanism for the 'Gray Fish Eye' Produced in Flash Welding of Tubes and Improvement of Technology"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 3, 1981 pp 96-102

TEXT OF ENGLISH ABSTRACT: In this paper the main problems concerning the quality of flash butt welding of boiler tubes from a technological point of view are discussed. It is emphasized that the prevailing explanation for the mechanism of forming low plasticity structures such as "gray fish eyes" remains to be perfected with further investigations.

The "gray fish eye" defects could be best put under control by technological means. The practical methods of improving welding technology are stated, and the selection of welding parameters analyzed. The paper also introduces the principle of the technique of preheat energy auto-control. In flash welding with preheating, the "heat level" of joints can be monitored by varying the degree of preheating, thus making the regulating process of welding parameters much more simplified.

The said improvements have been put into practice and proven to be reliable and satisfactory in production.

AUTHOR: LI Runmin [2621 3387 3046]  
LU Huangong [7120 3562 0501]  
ZHANG Ranger [1728 6245 0059]  
SUN Yusheng [1327 3768 3932]

ORG: All of Harbin Research Institute of Welding

TITLE: "The Influence of Weld Defects on the Fatigue Behavior of the Thick Wall Pressure Vessel"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 3, 1981 pp 103-110

TEXT OF ENGLISH ABSTRACT: The characteristic of fatigue failure caused by weld defects is that once a fatigue crack is initiated, unstabilized fracture can occur immediately. In this paper the influence of various kinds of weld defects on the fatigue behavior of the thick pressure vessel has been investigated by analyzing the proof-pieces of the vessel and the butt weld specimens with the fatigue crack initiation life method.

AUTHOR: LIU Huoxiang [0491 3499 4382]  
GUO Rongyuan [6753 2837 0337]

ORG: Both of the Dongfang Boiler Works

TITLE: "Hydraulic Destruction and Fatigue Tests of Cylindrical Model Vessel with Declivous Cracks"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 3, 1981 pp 111-122

TEXT OF ENGLISH ABSTRACT: In this paper we present a relation for the bulge effect factor of declivous cracks. With this relation, the calculated demolition load and cracking load are in line with their corresponding experimental results, the average error being about 8 percent. The said relation is therefore good for engineering practice. The law of declivous fatigue crack growth is examined, using the direct method and projective method to define the stress intensity factor at the top of a declivous crack after fatigue growth. Pursuing the Paris relation for crack growth rate in processing the data, we have obtained a crack growth rate formulation for 18MnMoNb steel. The fatigue growth angle of declivous cracks is also discussed.

AUTHOR: None

ORG: Zhengzhou Research Institute of Mechanical Engineering; Shanghai Boiler Works

TITLE: "Automatic Submerged-arc Welding of Nozzle-to-shell Joint on Pressure Vessel"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 3, 1981 pp 123-128

TEXT OF ENGLISH ABSTRACT: In the welding procedure of the nozzle-to-shell joints on pressure vessels, instead of the traditional manual arc process an automatic submerged-arc welding process has been developed and applied in order to tighten the welding control and attain a new height of welding efficiency. For this purpose an automatic welding machine (Model MZM-500) with a non-contact type high precision head following device to the saddle-shaped curve was made. Welding performance tests and welding production of nozzle-to-shell joints on a large pressure vessel for a power station boiler were carried out and excellent results were obtained. As compared with the manual arc process, the present submerged-arc welding process may raise the productivity up to three times and reduce the fabrication cost, the preheating temperature has been lowered and the working conditions for the welders have improved; at the same time, it provides high qualite assurance in the welded nozzle-to-shell joints.

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CSO: 4009/192

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